John L. Casti, Reality Rules: 2 Picturing the World in Mathematics. The Frontier (Wiley, New York, 1992) 424 pages

Chapter 5: *Strategies for Survival: Competition, Games and the Theory of Evolution.* Evolutionary epistemology. The neo-darwinian paradigm. Genetic vs. phenotypic change. Game theory—the basics. A typology of mixed-motive games. Replicators, hypercycles and selection. Equilibrium properties of replicator systems. Perseverance of species in replicator systems. Classification of replicator systems. Game theory and replicator systems. Desert plant root systems and ESS. ESS vs. optimality. Flowering times for plants under competition. Sociobiology. The evolution of cooperation. *Chapter* 6: *The Analytical Engine: A System-Theoretic View of Brains, Minds and Mechanisms.* Brains and minds. Input/output relations and control systems. Behavioral vs. cognitive psychology. Stimulus-response patterns and external system models. Cognitive states and internal models. Realizations and canonical models. Linear systems and canonical realizations. The ho realization algorithm. Partial realizations. Approximate modeling and inexact data. The state-space X. The cognitive theorem. Memory and behavior. Thoughts and group invariants. Linearity?. Reachability of bilinear systems. *Chapter* 7: *Taming Nature and Man: Control, Anticipation and Adaptation in Social and Biological Processes.* Classical optimal control theory. The minimum principle and open-loop control. Feedback control and dynamic programming. Anticipatory systems. Perfect subsystems and global failures. A taxonomy and adaptive systems. Metabolism-repair systems. Linear (M, R)-systems: repair. Linear (M, R)-systems: replication. Cellular networks and manufacturing processes. *Chapter* 8: *The Geometry of Human Affairs: Connective Structure in Art, Literature and Games of Chance.* Geometric paradigms. Sets and relations. Covers and hierarchies. Complexes, connections and traffic. Structure vectors and eccentricity. Complexity and Complexes. The Art of M. C. Escher. Connective structure in the work of Piet Mondrian. Chance and surprise. Simplicial complexes and dynamical systems. *Chapter* 9: *The Mystique of Mechanism: Computation, Complexity and the Limits to Reason.* Computing and cosmos. Algorithms and programs. Computation and reality. Formalization and Hilbert's program. The undecidable and the incomplete. Complexity, programs and numbers. The randomness of arithmetic. P and NP: The "easy" and the "impossible". Numerical analysis, complexity and information. Chaos, Gödel and truth. The rules of the game. *Chapter* 10: *How do we Know?: Myths, Models and Paradigms in the creation of beliefs.* Ordering the cosmos. Models and Theories. Paradigms, revolutions and normal science. Explanations vs. descriptions. "Good" models and "bad". Validation and falsification. Competition among models. Science and pseudoscience. Science, religion and the nature of belief systems. *Index.*

Robert A. Schapire, The Design and Analysis of Efficient Learning Algorithms (MIT Press, Cambridge, MA, 1992) 217 pages

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